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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/921,938	08/02/2001	Ian Latchford	AMAT/4227.P1/DD/BCVD/JW	8367

32588 7590 09/03/2003  
APPLIED MATERIALS, INC.  
2881 SCOTT BLVD. M/S 2061  
SANTA CLARA, CA 95050

14  
EXAMINER

WALKE, AMANDA C

ART UNIT	PAPER NUMBER
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1752

DATE MAILED: 09/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

AS14

# Office Action Summary

Application No.

09/921,938

Applicant(s)

LATCHFORD ET AL.

Examiner

Amanda C Walke

Art Unit

1752

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 20 May 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-15, 17 and 19-44 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15, 17 and 19-44 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)                      4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)                      5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_                      6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

This action is in response to the amendment filed 5/20/2003. In light of the amendment, the previous rejections have been dropped and a new rejection follows.

#### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-9 are rejected under 35 U.S.C. 102(b) as being anticipated by Leuschner et al (6,042,993).

Leuschner et al disclose a photolithographic structure generation process including the steps of employing a sputtering or chemical vapor deposition process to apply a layer of amorphous carbon (a-C:H) onto a substrate, then applying a top layer of an electron beam sensitive resist which contains silicon employing a spin-on deposition process (column 2, line 59 to column 3, line 45 and column 4, lines 6-12), exposing the top layer to form a pattern, developing the top layer, employing an oxygen plasma etch to transfer the pattern into the a-C:H layer (which decreases the thickness of the resist top layer(hard mask layer) to 15 nm [150Å]), then transferring the pattern to the substrate by employing a CF<sub>4</sub> plasma etch (see example 1).

The specification teaches that after exposure to an oxygen based etchant the photo resist layer may be used as a hard mask layer to etch the underlying layers, then the patterned amorphous carbon layer may be used as a hard mask to etch the underlying material layer. This appears to mean that the entire photoresist layer would be affected by the etchant and the entire

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layer would be the hard mask. The layer of photo resist in the reference is exposed to a laser to form a pattern and is developed. Then, the a-C:H layer is etched through the remaining portion of the photo resist layer by an oxygen etchant, which would form a hard mask of the outermost portions of the photo resist layer since these are the portions that would be exposed to the oxygen etchant, thus the material and method of the reference meet the present claim limitations requiring the step of forming an in situ resist layer hard mask in the outermost portions of the resist layer.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 10, 11, 17, 19-32, 36, 37, and 42-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leuschner et al in view of Mitani et al (6,191,463).

Leuschner et al has been discussed above but fails to teach or suggest the additional step of depositing a material layer onto the substrate prior to depositing the a-C:H layer.

Mitani et al disclose a method of forming a semiconductor device containing may consist of silicon oxide or silicon nitride by CVD. The use of the insulating layer improves the reliability of the material by decreasing the deterioration of the film (increasing the dielectric breakdown strength) (see column 2, lines 1-25 and 12, line 57 to column 13, line 5).

Given the teachings of Mitani et al it would have been obvious to one of ordinary skill in the art to prepare the material of Leuschner et al choosing to add an insulating layer of silicon

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oxide or silicon nitride as taught by Mitani et al to improve the reliability of the film with reasonable expectation of achieving a material having high resolution.

5. Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leuschner et al in view of Lin et al (6,087,064).

Leuschner et al has been discussed above but fails to teach or suggest a specific percentage of silicon in the layer of photoresist.

Lin et al disclose a silicon containing photoresist material containing between 5 and 10 % silicon. The reference further teaches that the use of a silicon containing resist provides the advantages of being capable of transferring a pattern of high resolution and good image profile to the underlying layers (see column 10, lines 1-46).

Given the teaching of Lin et al, it would have been obvious to one of ordinary skill in the art to prepare a device by the method of Leuschner et al using the silicon containing resist of Lin et al to increase the resolution of the formed pattern with reasonable expectation of achieving a material having high resolution.

6. Claims 33-35 and 38-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leuschner et al in view of Lin et al and Mitani et al.

All three references have been discussed above. The combination of Leuschner et al and Lin et al discussed above fails to teach or suggest the additional step of depositing a material layer onto the substrate prior to depositing the a-C:H layer.

As discussed above, Mitani et al disclose a method of forming a semiconductor device containing may consist of silicon oxide or silicon nitride by CVD. The use of the insulating layer

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improves the reliability of the material by decreasing the deterioration of the film (increasing the dielectric breakdown strength) (see column 2, lines 1-25 and 12, line 57 to column 13, line 5).

Given the teachings of Mitani et al it would have been obvious to one of ordinary skill in the art to prepare the material of Leuschner et al in view of Lin et al choosing the add an insulating layer of silicon oxide or silicon nitride as taught by Mitani et al to improve the reliability of the film with reasonable expectation of achieving a material having high resolution.

7. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Leuschner et al in view of Sobczak (4,576,834).

Leuschner et al has been discussed above but fails to teach or suggest a step of etching the photoresist layer, the amorphous carbon layer, and the resist hard mask in a single etching step.

Sobczak discloses a method of forming a device utilizing a oxygen RIE process. In the method of the reference, a layer of photo resist is deposited on a stack of layers coated on a substrate. The layer of resist is patterned to form an etch mask. Then the oxygen RIE process is performed which removes a portion of the photo resist in addition to removing/etching the underlying layers (which include oxide and nitride layers and a fluorocarbon layer). The reference teaches that it is known to etch the layers in a single sequence (column 6, lines 13-53).

Given the teachings of Sobczak that it is known to remove portions of the photo resist layer while etching the underlying layers during an oxygen RIE process, it would have been obvious to one of ordinary skill in the art to prepare the material of Leuschner et al and removing/etching a portion of the photo resist mask layer while simultaneously etching the underlying layers with reasonable expectation of achieving a material having high resolution.

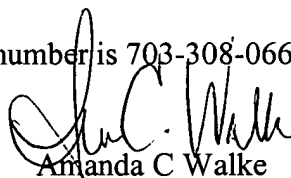
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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amanda C Walke whose telephone number is 703-305-0407.

The examiner can normally be reached on M-R 5:30-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Janet Baxter can be reached on 703-308-2303. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Amanda C Walke  
Examiner  
Art Unit 1752

ACW  
August 25, 2003